

DISTRIBUTION OF GAMETOPHYTIC POPULATIONS
OF *VITTARIA* AND *TRICHOMANES*
IN PENNSYLVANIA

JAMES C. PARKS

ABSTRACT

Fifty-eight of Pennsylvania's sixty-seven counties were surveyed for the presence of *Vittaria* and *Trichomanes* gametophytes. Sixteen new county records are noted for *Vittaria*. Five previous reports bring the total to twenty-one. *Trichomanes*, reported previously from twelve counties, is herein recorded from an additional thirty. Phytogeographical observations and comments for both taxa are included.

Key Words: *Vittaria*, *Trichomanes*, fern gametophytes, distribution

INTRODUCTION

The Appalachian *Vittaria* gametophyte has presented to biologists intriguing taxonomic, ecological, and distributional problems ever since its discovery by A. J. Sharp and identification by Wagner and Sharp (1963). Gametophytes of four tropical fern genera, including *Vittaria* and *Trichomanes*, were reported by Farrar (1967) to be reproducing independently of their sporophytes in the southern Appalachians. Farrar (1974, 1978) described gametophytes of *Vittaria*; Farrar and Wagner (1968) described those of *Trichomanes*. *Vittaria* gametophytes are shaped like thalloid ribbons while those of *Trichomanes* form tufts of filaments. The prothallia of both are gemmiferous, permitting them to reproduce independently of their sporophytes. Farrar (1978, 1985) considered problems of species assignment, habitat characteristics, and biogeography of these Appalachian plants. Both *Vittaria* and *Trichomanes* gametophytes occupy a habitat characterized as humid, shaded grottoes in noncalcareous rock, usually sandstone. Sporophytes of neither *Vittaria* nor *Trichomanes* are known to occur naturally in Pennsylvania.

While Farrar et al. (1983) established the presence of *Vittaria* and *Trichomanes* gametophytes in the Pennsylvania flora, relatively few sites were reported. *Trichomanes* gametophytes are reported from as far north as central Vermont (McAlpin and Farrar, 1978; Farrar et al., 1983; Miller, 1984), but the northernmost station for *Vittaria* is in Chautauqua Co., New York (Parks and Farrar, 1984). This paper presents the results of the first

intensive distributional study for a large area within the range of these taxa. The Wisconsinan terminal moraines are extensive in Pennsylvania (Berg, 1980) (Figure 1); therefore, a distributional study of these taxa in this region should clarify the problem of postglacial re-establishment of these genera in glaciated areas, considered by Farrar et al. (1983). The northern range limits of the Appalachian *Vittaria* gametophyte are most likely to be clarified by field work in this state. This study was also undertaken to determine if these recent additions to the Pennsylvania flora should be considered rare or endangered taxa in the Commonwealth.

METHODS

Fifty-eight of Pennsylvania's 67 counties were surveyed for the presence of *Vittaria* and *Trichomanes* gametophytes. By comparing an area on the Pennsylvania Geological Map (Berg, 1980) with the same one on a topographic map, locations containing rock exposures of a suitable substrate were located. Shaded grottoes in promising rock outcrops were explored extensively using a flashlight. When the plants were found, they were examined on site with a 10× lens, and a live specimen was collected. Specimens were later examined microscopically, dried, and deposited at MVSC. Appropriate geographic and ecological data were recorded and, at some sites where the plants were abundant, material was collected for laboratory culturing.

RESULTS AND DISCUSSION

Vittaria gametophytes were collected from 18 sites representing 16 new Pennsylvania county records (Figure 1). Including five county records at six sites reported by Farrar et al. (1983), *Vittaria* gametophytes are now known from 21 counties and 24 sites in Pennsylvania. *Trichomanes* gametophytes were collected from 75 sites representing 30 new county records (Figure 1). In areas where *Trichomanes* sites are relatively abundant, contiguous but distinct stations are not plotted on Figure 1; however, they are included in a complete list of collection sites (including those cited in the text), available from the author. Farrar et al. (1983) reported *Trichomanes* from 12 counties at 17 sites. However, Dr. Frank Busor of East Stroudsburg University (pers. corr.) indicated that

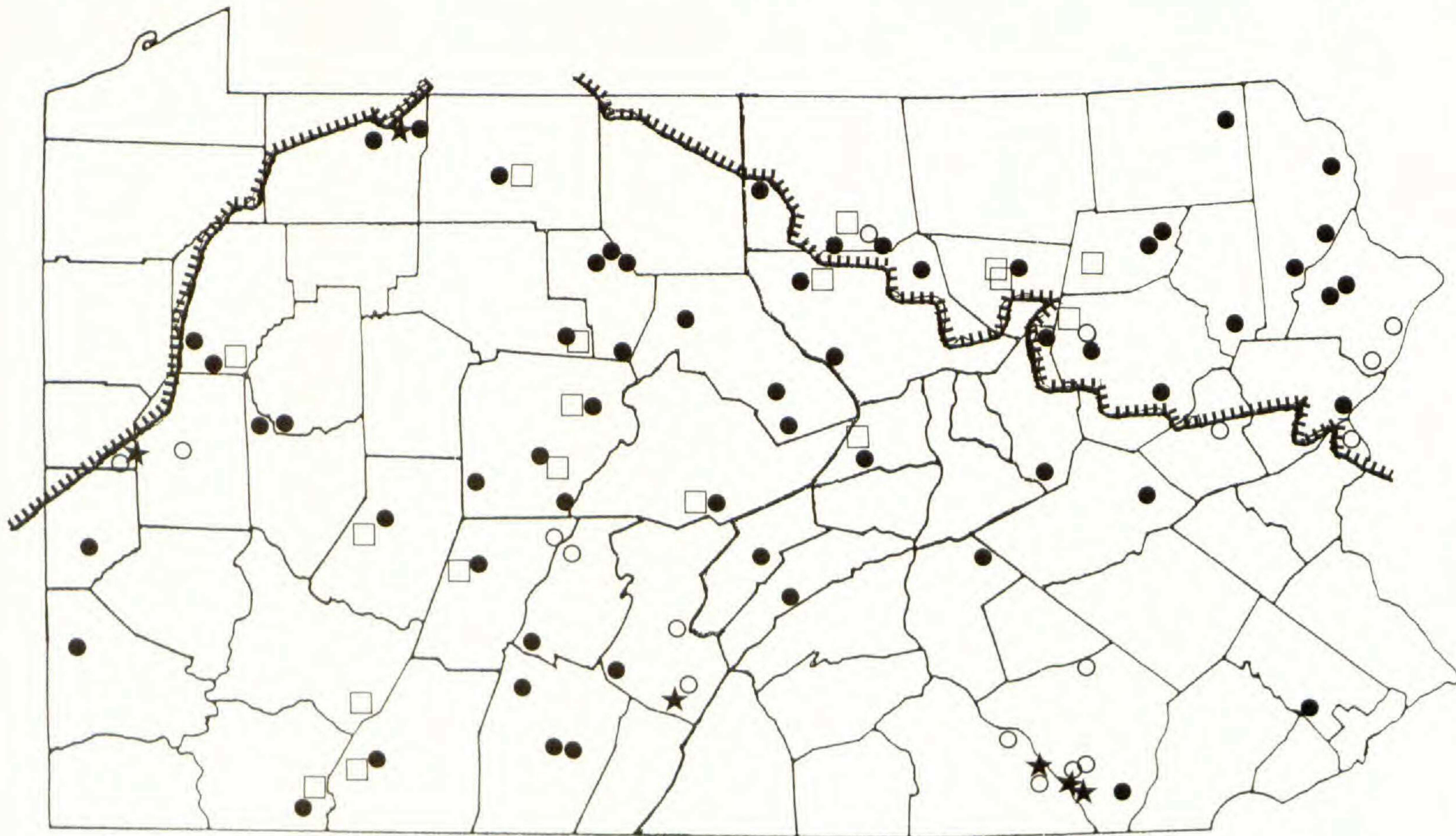


Figure 1. Distribution of *Vittaria* and *Trichomanes* gametophyte colonies in Pennsylvania. *Vittaria* stations from Farrar et al. (1983) ★; new records □. *Trichomanes* stations from Farrar et al. (1983) ○; new reports ●. Hatched line indicates the limits of Wisconsin glacialation.

the site reported for Monroe Co. would have to be in Northampton Co., as the substrate mentioned, Martinsburg Shale, does not occur in Monroe Co. This information is confirmed by study of the Pennsylvania Geological Map (Berg, 1980). As I have collected *Trichomanes* in Monroe Co. (*Parks 4339*), amending Farrar's site to Northampton Co. adds that county to those wherein *Trichomanes* grows. In total, *Trichomanes* gametophytes are now noted from 76 sites in 42 Pennsylvania counties.

The ecological requirements of *Vittaria* and *Trichomanes* gametophytes are evidently similar, as I have found them growing in close proximity at many sites (e.g., *Parks 4299* and *Parks 4300* in McKean Co., *Parks 4334* and *Parks 4335* in Somerset Co., *Parks 4551* and *Parks 4552* in Clearfield Co.). However, differences observed and reported below may prove helpful in locating these plants and in understanding their distribution. When the two were observed at the same site, they were usually growing in different rock crevices or overhangs. *Vittaria* is generally found at the very back of rock crevices but is sometimes observed as mats on the lower rock surface. The prothallia may be growing as little as 15–30 cm from the face or as far back as a 13 m (*Parks 4404* in Indiana Co.). *Trichomanes* gametophytes are usually hanging down in tufts from the upper surface of the rock crevice or on a vertical wall in a narrow crack. While *Trichomanes* is often found at *Vittaria* sites, it has been found frequently by itself on smaller exposures, at sites subject to more desiccation, and on a greater variety of rock types including shales (*Parks 4403* in Indiana Co.).

The distribution of *Vittaria* gametophytes in Pennsylvania relative to the Wisconsinan glacial moraines is different than that of *Trichomanes*. I have found *Trichomanes* at numerous sites in the glaciated Pocono Mountains (Figure 1) but I have not recovered *Vittaria* from this region. I have discovered five *Vittaria* sites in glaciated parts of Pennsylvania (Figure 1), all of them 30 km or less north of the Wisconsinan terminal moraines (cf. Crowl and Sevon, 1980). Of the two previous reports, one station in Ohio is ca. 90 km into glaciated terrain (Cusick, 1983) and one in New York is ca. 19 km north of the Wisconsinan terminal moraine (Parks and Farrar, 1984). These results indicate that the northern range limits of the Appalachian *Vittaria* gametophyte parallel closely the Wisconsinan terminal moraines. The distribution of *Vittaria* and *Trichomanes* gametophytes in Pennsyl-

vania supports the hypothesis of Farrar et al. (1983) that the post-Pleistocene dispersal of *Vittaria* gametophytes has been very limited, probably to spread of gemmae, whereas that of *Trichomanes* may have involved a northern extension of sporophytes. However, Farrar (1985) demonstrated that the independent gametophytes of both *Vittaria* and *Trichomanes* are enzymatically distinct from sporophyte-bearing species of their respective genera now living in the continental United States.

In summary, *Vittaria* gametophytes are quite rare in Pennsylvania, being known from only 24 sites primarily in unglaciated areas. The five new stations in glaciated country are all close to the Wisconsinan terminal moraines which probably parallel the northern range limits of this taxon. *Trichomanes* is more widespread, including numerous stations in glaciated regions, and will probably be found at many more sites.

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DEPARTMENT OF BIOLOGY
MILLERSVILLE UNIVERSITY
MILLERSVILLE, PA 17551